



**Euro-Latin American Parliamentary Assembly  
Assemblée Parlementaire Euro-Latino Américaine  
Asamblea Parlamentaria Euro-Latinoamericana  
Assembleia Parlamentar Euro-Latino-Americana**



*Committee on Social Affairs, Human Exchanges,  
the Environment, Education and Culture*

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12.4.2011

## **WORKING DOCUMENT**

Prevention of natural disasters

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## **Introduction**

Geographical and climate conditions, as well as the fragility of the development models applied in Latin America and the Caribbean, have combined to make the region vulnerable to natural disasters.

Over time, Latin America has suffered earthquakes, hurricanes, drought, floods and other disasters which have held its countries back economically, politically and socially and stunted their economic growth and sustainable development.

Therefore, in order to provide a clear view of the problems facing the countries of Latin America in terms of preventing and limiting natural disasters, the first part of this report outlines Latin America's context: its geographical location, climate conditions and the main disasters which affected the region at the beginning of 2010, such as the earthquakes in Haiti and Chile, and their implications at a planetary level. It also describes the factors which have made the region more vulnerable to natural disaster, such as population growth and inappropriate land use. The second part of the report presents the measures adopted by the Andean Community, such as the Andean Strategy for Disaster Prevention and Assistance (Decision 591), the Andean Committee for Disaster Prevention and Assistance (CAPRADE) and the Andean Community Disaster Prevention Project (PREDECAN). Thirdly, emphasis is placed on the importance of international cooperation between the EU and Latin America and the Caribbean in providing funding for projects and programmes through which the region's countries can implement disaster prevention measures, bearing in mind that these require not only government participation but that of society as a whole. Lastly, attention is drawn to the importance of using Cat bonds in the region as a funding mechanism with which to promote the prevention of natural disasters.

Finally, the report considers it essential that Latin American countries set in place, through bilateral and multilateral cooperation, the necessary mechanisms with which to prevent and effectively respond to all types of natural phenomena, particularly in view of the fact that prevention of natural disasters contributes to the sustainable development of the region.

## **I. Geophysical characteristics of Latin America and the Caribbean**

The Latin American and Caribbean region is characterised by its geographical and climatic diversity, which has made it globally unique. Nevertheless, its geographical location has been the main factor responsible for its vulnerability to natural disasters.

Throughout its history, Latin America has suffered numerous natural disasters, defined as natural events whose impact in terms of injuries, homelessness, fatalities and destruction of assets creates severe economic and social hardship.

Location is the primary explanation for Latin America's vulnerability to natural disaster. The region is extremely prone to earthquakes, landslides, tidal waves and volcanic eruptions because its territory sits atop four active tectonic plates<sup>1</sup>:

- (a) the Cocos plate: located under the Pacific Ocean on the west coast of Central America;

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<sup>1</sup> Geography and Development. Taken on 28 October 2010 from:  
[http://www.iadb.org/res/publications/pubfiles/pubB-2000\\_4027.pdf](http://www.iadb.org/res/publications/pubfiles/pubB-2000_4027.pdf)

- (b) the Nazca plate: located in the eastern Pacific Ocean, along the west coast of South America, directly opposite the coast of Peru and Chile. This was one of the plates responsible for the earthquake in Valdivia, Chile, in 1960 and the one on 27 February 2010, also in Chile, the epicentre of which was located in the Chilean Sea;
- (c) the South American Plate: covers the South American continent and part of the South Atlantic Ocean, with an extent of around 9 million square kilometres;
- (d) the Caribbean plate: stretches under part of the Central American landmass (Guatemala, Belize, Honduras, Nicaragua, El Salvador, Costa Rica, Panama) and forms the floor of the Caribbean Sea off the northern coast of South America, with a surface area of 3.2 million square kilometres.

It is significant that the South American plate is aligned with the Nazca plate to the west and the Caribbean plate to the north, making Latin America as a whole highly prone to violent tectonic thrusts from all three plates.

Furthermore, the west coast of South America lies in a subduction zone<sup>2</sup> where the Nazca plate slides under the South American plate at a rate of about 80mm a year, building up an overlap of up to 10 metres over 170 years. Collisions of this type were responsible for the formation of the Andes and have caused the most devastating earthquakes<sup>3</sup>, such as that which took place in Chile in 2010.

Similarly, the Latin American region lies within the Pacific 'Ring of Fire', which encircles the Pacific Ocean and concentrates several of the world's major subduction zones, giving rise to intense seismic and volcanic activity in this area.

The Ring of Fire includes Chile, Peru, Ecuador, Colombia, Central America (Panama, Costa Rica, Nicaragua, Honduras, El Salvador and Guatemala), Mexico, the United States, and Canada, then curves round the Aleutian Islands and descends along the coasts and islands of Russia, China, Japan, Taiwan, the Philippines, Indonesia, Papua New Guinea, Australia and New Zealand. The rings extends over some 22 000 km and accounts for 80% of the earth's seismic and volcanic activity<sup>4</sup>.

In addition to its geological context, many parts of Latin America are affected by extreme weather conditions, which take the form of severe droughts, floods and high winds caused by the phenomena known as El Niño (a global weather phenomenon involving the oceanic-atmospheric system, associated with a period of warming of the surface waters in the central and east-central Equatorial Pacific, which takes place atypically every 3-5 years and is also associated with the warming of the sea along the whole of the western tropical coast of South America)<sup>5</sup> and La Niña, which in addition to their impact on the region's agriculture, also affect the population's quality of life.

The main impact of El Niño during 2009 and 2010 has been a disproportionate rise in temperatures and a lack of rainfall in some regions, leading to problems such as water

<sup>2</sup> where an oceanic lithospheric plate slides under another, adjacent plate, which is usually continental

<sup>3</sup> Chile: Topografía de la convergencia de las placas de Nazca / Sudamericana. Taken on 28 October 2010 from: <http://pixelaris.wordpress.com/2010/03/01/chile-topografia-de-la-convergencia-de-las-placas-de-nazca-sudamericana/>

<sup>4</sup> Geography and Development in Latin America. Op. Cit.

<sup>5</sup> Sobre el Fenómeno de El Niño. Taken on 29 October 2010 from: <http://www.cathalac.org/Cambio-Climatico/sobre-el-nino/Sobre-el-Fenomeno-de-El-Nino>

rationing, forest fires and electricity shortages in some regions. Ecuador, for example, suffered its worst drought in 40 years at the beginning of 2010, causing the water levels in its hydroelectric reservoirs to drop so low that the government was forced to declare an emergency in the energy sector, ration supply and import power from Colombia and Peru.

In Bolivia, the government activated an emergency plan to counter the effects of a drought in the departments of La Paz (west), Santa Cruz (east), Tarija (south) and Chuquisaca (south-east), which led to the death of over 11 000 head of cattle and 20 000 hectares of failed crops.

Colombia underwent a period of sustained high temperatures and poor rainfall in the rainy season. Due to El Niño, the country's major rivers such as the Magdalena shrank, losing their depth and breadth.

Paraguay and Argentina also suffered a lack of rainfall and an increase in forest fires, which affected most of their farmed crops<sup>6</sup>.

From the second half of 2010 on, the La Niña phenomenon has been causing heavy rain, hurricanes and tropical storms across most of Central America.

Global warming has clearly made it harder to predict these climate phenomena with any certainty, since their duration has become increasingly variable, with extreme effects ranging from severe drought caused by high temperatures to countless floods due to excessive rainfall. This makes it all the more important for countries in the region to develop disaster prevention programmes, so that they can be adequately prepared for any type of natural eventuality.

### **Major catastrophes in Latin America and the Caribbean**

Even considering Latin America's geographical location and climate conditions, recent years have seen a disproportionate number of disasters which have had serious social and economic consequences. Between 1900 and 1999, 1 309 natural disasters were recorded in the region, equivalent to 19% of the total recorded worldwide figure, giving the region the second highest number of disasters after Asia (44%). Between 1970 and 1999, the region suffered 972 disasters, resulting in the deaths of 227 000 people, rendering eight million homeless and indirectly affecting almost 148 million. The annual average cost of these disasters over the last 30 years is estimated at between USD 700 million and USD 3.3 billion<sup>7</sup>.

Several natural disasters took place in Latin America during the first decade of the 21st century, including earthquakes, which according to the 2010 World Disaster Report, published by the International Federation of Red Cross and Red Crescent Societies (IFRC), have caused over 50 000 deaths a year between 2000 and 2008. In 2009, natural disasters killed 10 551 people<sup>8</sup>, a figure which is set to rise in 2010 due to the Haitian and Chilean earthquakes at the beginning of that year.

The first Latin American country to experience the devastating force of an earthquake in this millennium was Peru. The quake which shook the Pisco region in 2007 registered 7.9 on the Richter scale and killed 596 people. The area was almost totally destroyed and the streets of

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<sup>6</sup> Fenómeno "El Niño" causa estragos en varios países. Taken on 28 October 2010 from: <http://www.radiomundial.com.ve/yvke/noticia.php?41553>

<sup>7</sup> Agenda Ambiental Andina. Problemática de los Desastres. Taken on 28 October 2010 from: <http://www.comunidadandina.org/desastres/problematika.htm>

<sup>8</sup> Miles están en riesgo ante desastres. Taken on 28 October 2010 from: <http://www.eluniversal.com.mx/internacional/69803.html>

the affected towns are still buried under rubble. The precarious construction and endemic poverty of the region combined perfectly to create this desolate post-quake situation<sup>9</sup>.

The earthquake in Haiti, which registered 7 on the Richter scale and caused over 222 000 deaths, is considered to be one of the most devastating to have hit the region. Inequalities and high levels of violence have prevented the country from fully recovering from the disaster, helping to keep it in a state of poverty.

The Chilean earthquake (8.8 on the Richter scale) caused the death of around 500 people and was the second strongest to hit the country after the Valdivia quake in 1960 (9.5 on the Richter scale). Apart from its economic and social impact within Chile, this quake also affected the structure of the planet, since the movement of large subterranean land masses changed the Earth's weight distribution. According to preliminary calculations by NASA geophysicist Richard Gross, the Earth's axis shifted by approximately 8cm.

Another result of this earthquake was that the Earth's rotation speeded up, reducing the length of each day by 1.26 milliseconds. While this change is of course imperceptible, and according to experts is unlikely to cause climate changes or other major alterations, it provides a measure of the intensity of the earthquake<sup>10</sup>.

Having looked at the major disasters which have taken place in the region, it can be said that 'the region's overall vulnerability to natural disasters is not only determined by location and climate but also by various socioeconomic factors that greatly magnify the lethal and destructive potential of these events'. In other words, human settlement patterns, poor quality housing and infrastructure, environmental degradation, the lack of efficient risk mitigation strategies and extreme economic vulnerability have become the main reasons why Latin American countries are continually afflicted by natural disasters.

Furthermore, high population density in disaster-prone areas significantly contributes to the region's vulnerability. The fragility of some countries has increased due to migration patterns which have in most cases been caused by forced displacement or the pursuit of better living conditions.

Similarly, rapid population growth and the high level of rural-urban migration has meant that most cities have expanded without proper urban planning, building codes or land-use regulations adapted to their geographical environment<sup>11</sup>. The result is that most housing stock in Latin America lacks the technical conditions and maintenance which could enable it to withstand different types of natural disaster.

The degradation of the environment also plays a crucial role in transforming natural events into disasters. Throughout the region, risk of flooding and landslides is exacerbated by deforestation of watersheds, the absence of soil-conservation programmes and inappropriate land use. Environmental degradation in the region is the result of higher population density in fragile ecosystems, as well as destructive agricultural activities<sup>12</sup>.

Latin American countries are also economically vulnerable. 'The macroeconomic impact of

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<sup>9</sup> Los Desastres Naturales Más Fuertes De Los Años 2000. Taken on 29 October 2010 from: [http://actualidad.rt.com/ciencia\\_y\\_tecnica/medioambiente\\_espacio/issue\\_5024.html](http://actualidad.rt.com/ciencia_y_tecnica/medioambiente_espacio/issue_5024.html)

<sup>10</sup> Consecuencias del terremoto en Chile. Cambios en el eje terrestre y en la duración del día. Taken on 29 October 2010: <http://geologia.suite101.net/article.cfm/consecuencias-del-terremoto-en-chile#ixzz13IAIYMXe>

<sup>11</sup> Geography and Development in Latin America. Op. Cit.

<sup>12</sup> Ibid

natural disasters mainly depends on the degree of vulnerability, the importance of the economic activities affected, and their impact on other productive and public finances'<sup>13</sup>. The fact that the Latin American region is predominantly agricultural and lacks sectoral diversification limits its ability to respond to and recover from natural disasters, since the farming sector is the one most vulnerable to and worst affected by earthquakes, flood and drought.

Generally speaking, population settlement in areas with a high risk of landslides has led to worrying levels of disorganisation and disregard for land occupation policies and poorly developed resource management. This has made it essential to implement urgent measures, as part of development planning, to properly plan and structure settlement sites in both urban and rural areas and promote the construction of infrastructure which meets adequate building standards and can withstand all types of natural phenomenon.

## **II. Action taken by the Andean Community (CAN)**

Disaster prevention is a key component of the Andean Environmental Agenda and one which the Andean countries (Bolivia, Colombia, Ecuador and Peru) have been working on at intra-community level, in view of the immense impact of natural catastrophes. Its three main lines of action are:

### **1. The Andean Strategy for disaster prevention and response (Decision 591)**

The Andean Strategy was created to respond to the ongoing risk of disasters in the Andean Community and was adopted by the Andean Council of Foreign Affairs Ministers in July 2004.

The document sets out sectoral strategies with their respective lines of action, and proposes five main areas of work:

- (a) Strengthening of institutions and capacities at Andean subregional, national and local level;
- (b) Information, research and development;
- (c) Risk identification, evaluation and monitoring, early warning systems and specific plans;
- (d) Development of active prevention awareness with social participation;
- (e) Mutual aid in the event of a disaster.

### **2. The Andean Committee for Disaster Prevention and Response (CAPRADE)**

The aim of CAPRADE is to 'help reduce the risk and impact of natural and manmade disasters in the territory of the Andean subregion, through the coordination and promotion of policies, strategies and plans and the promotion of disaster prevention, mitigation, preparedness, response, rehabilitation and rebuilding programmes, through cooperation, mutual aid and exchange of experiences'. The committee has held nine meetings, the latest in June 2007.

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<sup>13</sup> Ibid

### **3. The Andean Community Disaster Prevention Project (PREDECAN)**

This project aims to improve risk management and disaster prevention services through strengthening national policies, institutions and coordination of activities in these areas. The project arose from the convention signed by the Secretary-General of the CAN in association with the Andean Committee for Disaster Prevention and Relief (CAPRADE) and the European Commission.

During the technical implementation period, 2005 – 2009, the PREDECAN Project provided support to CAPRADE in the context of the promotion and implementation of the Andean Strategy for Disaster Prevention and Relief.

Through PREDECAN, the European Commission supported disaster prevention programmes in the Andean subregion, which were led by the national government and relevant institutions of each country involved. The Commission and the countries of the Andean Community provided funding to a total value of 12.4 million euros.<sup>14</sup>

### **III. Cooperation on disaster prevention between the EU and Latin America and the Caribbean**

Due to its geographical location, fragile development models, lack of institutional disaster prevention and rapid response policies, and its population's lack of awareness and information about the existing dangers, and as a result of the situations now arising due to global warming, Latin America is more at risk from natural disasters and risk situations caused by climate variations.

The concentration of responsibility for disaster prevention and response with the State has compromised fiscal stability and macroeconomic operation<sup>15</sup>. It is therefore necessary to look at the role which the private sector can play in areas such as creating insurance and reinsurance markets, education, research, mass media and public information, among other possibilities.

Similarly, civil society has been insufficiently involved in institutionally developed processes for disaster prevention and response and in reconstruction processes, although it has been clearly shown that the success of such processes requires the active involvement of communities in the design, management and monitoring of programmes<sup>16</sup>.

It is therefore essential for all sectors of society to take a more active role; families, businesses, NGOs, international organisations and governments should prioritise disaster mitigation and prevention as being the only way to prevent or reduce the immediate consequences of potentially dangerous situations and the adverse effects they may have on life, dwellings and surrounding assets<sup>17</sup>.

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<sup>14</sup> Proyecto PREDECAN. Taken on 29 October 2010 from:  
<http://www.comunidadandina.org/predecan/predecan.html>

<sup>15</sup> Agenda Ambiental Andina. Problemática de los Desastres. Op. Cit.

<sup>16</sup> Ibid

<sup>17</sup> Living with risk - focus on disaster risk reduction. Taken on 29 October 2010 from  
[http://www.unisdr.org/eng/about\\_isdr/basic\\_docs/LwR2004/ch1\\_Section1.pdf](http://www.unisdr.org/eng/about_isdr/basic_docs/LwR2004/ch1_Section1.pdf)

Although political backing for disaster reduction policies should stem from the political leadership, their success will depend on the extent to which the awareness of risk and actions proposed are able to mesh with the local culture and social habits. In order for communities to become more sustainable, a political commitment must be made, with society as a whole becoming involved in risk reduction. Societies will become resistant when they start to include risk transformation and management processes into their sustainable development plans<sup>18</sup>.

Following this line of thought, disaster prevention has become an indispensable component of sustainable development, since if countries can be better prepared for natural disasters, if disaster-resistant infrastructure can be built, if poverty levels can be reduced and economic growth sustained, Latin America and the Caribbean will be less adversely affected by the natural phenomena which form part of our natural surroundings. In other words, sustainable development cannot be achieved if we, the Latin American countries, do not implement policies, programmes and projects to limit the impact of natural disasters and enable us to withstand them.

For this reason, international cooperation among the countries of Latin America is crucial if we are to work shoulder to shoulder implementing new projects and monitoring those which are already established to prevent and reduce natural disasters. One of our principal objectives should be to strengthen and expand the work of CAPRADE, the Andean Community, the Coordinating Centre for the Prevention of Natural Disasters in Central America (CEPREDENAC), the Central American Integration System (SICA) and the Caribbean Disaster Emergency Response Agency (CDERA).

This joint work by the Latin American countries undoubtedly requires the support of the European Union and the international community, making it essential to establish mechanisms for coordinated action on disaster prevention and response within the framework of the Bi-regional Strategic Partnership between the EU and Latin America and the Caribbean and, more specifically, in the Euro-Latin American Parliamentary Assembly (EuroLat).

It is therefore of vital importance for the EU to cooperate with our region, both technically and financially, so that the International Strategy for Disaster Reduction (ISDR) can be carried out in Latin America, fulfilling the following proposed short-term objectives:

- increase popular awareness and understanding of risk, vulnerability and disaster reduction;
- promote the commitment of public authorities to disaster reduction;
- stimulate multidisciplinary and intersectoral partnerships, including the expansion of risk reduction networks;
- improve scientific knowledge about the causes of natural disasters, as well as the effects that natural hazards and related technological and environmental disasters have on societies.<sup>19</sup>

It is also essential that due importance be given, within the context of development cooperation, to providing proper training to the emergency services and institutions, since they are the first on the scene at any emergency. They need to be provided with the necessary

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<sup>18</sup> Ibid

<sup>19</sup> Ibid



infrastructure and adequate resources, so that they have sufficient equipment and rescue teams. It is important to control and monitor the resources assigned to them, to ensure that they are not diverted elsewhere or used for other purposes.

In conclusion, disaster prevention needs to be at the core of local and regional policies. To ensure this, EU-LAC cooperation must focus on supporting prevention measures, such as the definition of new safety guidelines for building and land use, construction of shock-resistant buildings, so that the health services can continue working in the aftermath of a disaster and environmental protection through outlawing deforestation and providing greater protection for watersheds. Such measures will certainly reduce our region's vulnerability to natural disasters and gradually increase its capacity to respond to and recover from any type of natural emergency.

#### **IV. Catastrophe or 'CAT' Bonds**

CAT bonds are corporate bonds which require investors to forgive the total value of the bond and/or the interest on it in the event of the losses from a catastrophe exceeding a specified level<sup>20</sup>.

CAT bonds are issued by an insurer or other entity<sup>21</sup> and must comply with certain conditions applied to them. The principle underlying the issue of a CAT bond is that the payment of interest or repayment of the principal is linked to whether or not a catastrophe occurs<sup>22</sup>.

In other words, investors will gain if no catastrophe takes place during the period covered by the bond, but will lose if a disaster occurs.

The issue of CAT bonds is a recent alternative to traditional reinsurance. They were first issued during the mid-1990s and their use has increased in recent years. The following chart illustrates the issue and circulation of CAT bonds internationally.

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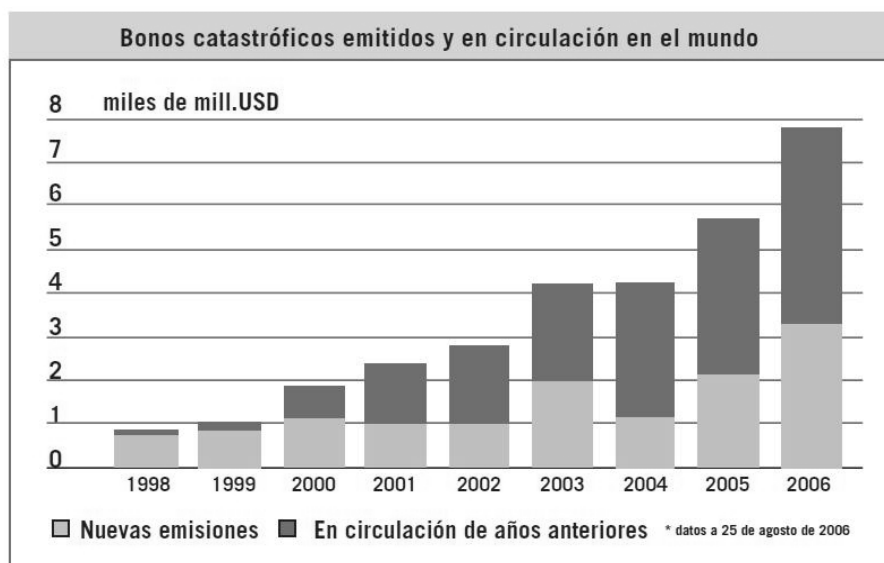
<sup>20</sup> Titulización de bonos de catástrofe y riesgo moral. Taken on 2 November 2010 from: <http://www.uv.es/asepuma/X/F47C.pdf>

<sup>21</sup> Gestión de riesgos. Taken on 2 November 2010 from: [http://www.riskgroup.com.ar/servicios\\_16\\_ar.php](http://www.riskgroup.com.ar/servicios_16_ar.php)

<sup>22</sup> López, P. Cat Bonds. Taken on 2 November 2010 from: [http://www.mapfre.com/documentacion/publico/i18n/catalogo\\_imagenes/grupo.cmd?path=1035719](http://www.mapfre.com/documentacion/publico/i18n/catalogo_imagenes/grupo.cmd?path=1035719)

## Catastrophe bonds issued and in circulation worldwide

- new issues
- in circulation from previous years



Fuente: Swiss Re (2006) Nota: La Mayor parte de estos BC fueron emitidos en EE.UU.y Europa.

Source: Bonos Catastróficos: ¿la nueva revolución en el mercado de seguros? in: [http://www.fasecolda.com/fasecolda/BancoMedios/Documentos%20PDF/rev\\_fas\\_125.pdf](http://www.fasecolda.com/fasecolda/BancoMedios/Documentos%20PDF/rev_fas_125.pdf) p. 23

### Advantages of CAT bonds compared with traditional reinsurance

For the issuer:

- Increases the capacity of the market, since said capacity is provided by investors instead of traditional reinsurers
- Most of the funds invested in this type of bond is new money, which would never have been used for traditional reinsurance purposes
- The credit risk to insurers is reduced

For the investor:

- Increases the spread of the investor's portfolio, since the underlying risk of the bond is not linked to the evolution of financial markets. Investors in this type of bond are mainly hedge funds

### Conclusions

- Although CAT bonds are unlikely to replace traditional reinsurance, it is clear that they are a perfectly valid alternative when it comes to providing risk capacity for major catastrophes
- The major catastrophes which took place during 2005, in particular Hurricane Katrina, have further reduced traditional reinsurance's capacity to cover this type of risk. We believe that this will increase demand for CAT bonds. Increased demand will also lead to more standardised issue and maybe a secondary, effectively liquid, market for these bonds, which would result in a reduction in transaction costs, bringing down the final price
- Finally, given that these bonds cover catastrophic risks with a very low probability of occurrence, there is as yet little information on how, or to what extent, CAT bonds have been affected by the occurrence of a major catastrophe. It has yet to be seen how investors

will react when such an event takes place.
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Source: Cat Bonds, in:

[http://www.mapfre.com/documentacion/publico/i18n/catalogo\\_imagenes/grupo.cmd?path=1035719](http://www.mapfre.com/documentacion/publico/i18n/catalogo_imagenes/grupo.cmd?path=1035719)

## Conclusions

Disaster prevention in Latin America and the Caribbean is a challenge closely linked with the strengthening of sustainable development in the region, since the more the impact of natural disasters on people's lives and on the political, economic and social infrastructure of its countries can be reduced, the easier it will be for the region to withstand the adversities of nature.

To achieve this, it is essential that the processes surrounding the development of disaster reduction strategies lead to an understanding of risk and vulnerability, to mobilise awareness and improve management, thereby resulting in more secure long-term development planning based on prevention rather than cure<sup>23</sup>.

Following this line of thought, the institutions of the European Parliament and the Latin American parliaments should focus on disaster prevention as a challenge which can be used to build sustainable development. A commitment should be sought from Latin American parliaments to push for government policies linking disaster prevention to the concept of sustainable development.

The region should associate itself with the capital market through the use of financial instruments such as CAT bonds, to complement existing insurance and reinsurance in the region. The issue of catastrophe bonds should be encouraged, so that Latin American countries can have access to the necessary financial resources with which to recover from any natural disaster and provide assistance to those affected. The cooperation of the developed countries is important in this respect, to enable the region's countries to have access in the medium term to this mechanism which will improve their capacity to respond to any natural disaster.

Generally speaking, it is essential that cooperation between the EU and Latin America should be based on the creation of joint measures to promote strategies aimed at changing the circumstances in which natural phenomena are currently faced, to promote actions which can be sustainable over time and include a political, social and cultural commitment by society as a whole. Disaster prevention and relief is a commitment which we, as parliamentarians and representatives of the people of Latin America, must assume with full seriousness.

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<sup>23</sup> Living with risk - focus on disaster risk reduction. Op. Cit.